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WHAT IS CLAIMED IS:

- 1. (currently amended) A method for exponentially and selectively amplifying a target nucleic acid in <u>a helicase-dependent</u> reaction, the method comprising:
 - (a) providing single strand templates of the target nucleic acid to be amplified;
 - (b) adding oligonucleotide primers for hybridizing to the templates of step (a);
 - (c) synthesizing an extension product of the oligonucleotide primers which are complementary to the templates, by means of a DNA polymerase to form a duplex;
 - (d) contacting the duplex of step (c) with a helicase preparation for unwinding the duplex such that the helicase preparation comprises a helicase and a single strand binding protein (SSB) unless the helicase preparation comprises a thermostable helicase wherein the single strand binding protein is optional; and
 - (e) repeating steps (b)-(d) to exponentially and selectively amplify the target nucleic acid in a helicase-dependent reaction such that amplification does not occur in the absence of the helicase as determined by gel electrophoresis.
- 2. (original) A method according to claim 1, wherein amplification is isothermal.
- 3. (cancel) A method according to claim 1, wherein the target nucleic acid of step (a) is a single stranded nucleic acid.

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4. (previously presented) A method according to claim 1, wherein the target nucleic acid is a DNA.

- 5. (currently amended) A method according to claim 31, wherein the target nucleic acid is an RNA.
- 6. (original) A method according to claim 1, wherein the target nucleic acid is a double-stranded nucleic acid, the double-stranded nucleic having been denatured by heat or enzymatically prior to step(a).
- 7. (original) A method according to claim 1, wherein the target nucleic acid has a size in the range of about 50bp to 100kb.
- 8. (original) A method of claim 1, wherein the oligonucleotide primers are a pair of oligonucleotide primers wherein one primer hybridizes to 5'-end and one primer hybridizes to 3'-end of the target nucleic acid to be selectively amplified.
- 9. (original) A method according to claim 1, wherein the oligonucleotide primers have a length and a GC content so that the melting temperature of the oligonucleotide primers is about 10°C-30°C above the reaction temperature of hybridization during amplification.
- 10. (original) A method according to claim 9, wherein the DNA polymerase is selected from a Klenow fragment of *E. coli* DNA polymerase I, T7 DNA polymerase (Sequenase) and Bst polymerase large fragment.

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11. (original) A method according to claim 10, wherein the DNA polymerase lacks 5' to 3' exonuclease activity.

- 12. (original) A method according to claim 11, wherein the DNA polymerase possesses strand displacement activity.
- 13. (original) A method according to claim 1, wherein the helicase preparation comprises a single helicase.
- 14. (withdrawn) A method according to claim 1, wherein the helicase preparation comprises a plurality of helicases.
- 15. (withdrawn) A method according to claim 1, wherein the helicase preparation comprises a 3' to 5' helicase.
- 16. (withdrawn) A method according to claim 1, wherein the helicase preparation comprises a 5' to 3' helicase.
- 17. (withdrawn) A method according to claim 1, wherein the helicase preparation comprises a superfamily 1 helicase.
- 18. (withdrawn) A method according to claim 1, wherein the helicase preparation comprises a superfamily 4 helicase.
- 19. (withdrawn) A method according to claim 1, wherein the helicase preparation is selected from a superfamily 2 helicase, a superfamily 3 helicase, and an AAA⁺ helicase.
- 20. (withdrawn) A method according to claim 1, wherein the helicase preparation comprises a hexameric helicase.

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- 21. (withdrawn) A method according to claim 1, wherein the helicase preparation comprises a monomeric or dimeric helicase.
- 22. (withdrawn) A method according to claim 1, wherein the helicase preparation comprises a UvrD helicase or homolog thereof.
- 23. (withdrawn) A method according to claim 22, wherein the UvrD helicase comprises a thermostable helicase or homolog thereof
- 24. (withdrawn) A method according to claim 1, wherein the helicase preparation comprises one or more helicases selected from the group consisting of: a UVrD helicase, a recBCD helicase, *E. coli* UvrD helicase, Tte-UvrD helicase, T7 Gp4 helicase, RecBCD helicase, DnaB helicase, MCM helicase, Rep helicase, RecQ helicase, PcrA helicase, SV40 large T antigen helicase, Herpes virus helicase, yeast Sgs1 helicase, DEAH_ ATP-dependent helicases and Papillomavirus helicase E1 protein and homologs thereof.
- 25. (withdrawn) A method according to claim 22, wherein the UvrD helicase is *E.coli* UvrD helicase.
- 26. (withdrawn) A method according to claim 23, wherein the thermostable helicase is Tte-UvrD helicase.
- 27. (withdrawn) A method according to claim 1, wherein the helicase preparation comprises a RecBCD helicase.
- 28. (withdrawn) A method according to claim 14, wherein the helicase preparation comprises T7 gene 4 helicase and *E. coli* UvrD helicase.

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- 29. (original) A method according to claim 1, wherein the energy source in the helicase preparation is selected from adenosine triphosphate (ATP), deoxythymidine triphosphate (dTTP) or deoxyadenosine triphosphate (dATP).
- 30. (original) A method of claim 29, wherein the ATP, dATP or dTTP are at a concentration in the range of about 0.1-50mM.
- 31. (previously presented) A method according to claim 1, wherein the helicase preparation comprises a single strand binding protein.
- 32. (previously presented) A method according to claim 31, wherein the single stranded binding protein (SSB) is selected from T4 gene 32 SSB, *E.coli* SSB, T7 gene 2.5 SSB, phage phi29 SSB and derivatives therefrom.
- 33. (original) A method according to claim 1, wherein the helicase preparation comprises an accessory protein.
- 34. (withdrawn) A method according to claim 33, wherein the accessory protein for a UvrD helicase is MutL.
- 35. (withdrawn) A method according to claim 1, wherein the helicase preparation comprises *E. coli* UvrD helicase, ATP, *E. coli* MutL protein and T4Gp32.
- 36. (withdrawn) A method according to claim 1, wherein the helicase preparation comprises *E.coli* RecBCD, ATP, and T4 Gp32 SSB.

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37. (withdrawn) A method according to claim 1, wherein the helicase preparation comprises T7 Gp4B helicase, dTTP, and T7 Gp2.5 SSB.

- 38. (withdrawn) A method according to claim 1, wherein the helicase preparation comprises the thermostable Tte-UvrD helicase, dATP or ATP.
- 39. (withdrawn) A method according to claim 1, wherein the helicase preparation comprises the thermostable Tte-UvrD helicase, dATP or ATP and T4 gp32 SSB.
- 40. (original) A method according to claim 1, wherein steps (b) (e) are performed at a substantially single temperature in the range of about 20°C 75°C.
- 41. (original) A method according to claim 1, wherein steps (b)-(e) are performed at about 37°C.
- 42. (previously presented) A method according to claim 23, wherein steps (b)-(e) are performed at about 60°C and the helicase in the helicase preparation is a thermostable helicase.
- 43. (original) A method according to claim 1, wherein the target nucleic acid is obtained from a pathogen in a biological sample, and step (e) further comprises amplifying the target nucleic acid to detect the pathogen.
- 44. (original) A method according to claim 1, wherein the target DNA is chromosomal DNA and step (e) further comprises detecting a sequence variation in the chromosomal DNA.

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45. (original) A method according to claim 44, wherein the sequence variation is a single nucleotide polymorphism.

- 46. (withdrawn) A nucleic acid amplification kit, comprising: a helicase preparation; a DNA polymerase; and instructions for performing helicase dependent amplification according to claim 1.
- 47. (withdrawn) A nucleic acid amplification kit according to claim 46, wherein the helicase preparation comprises:

a UvrD helicase, a single strand binding protein and adenosine triphosphate, for performing amplification according to claim 1.

- 48. (withdrawn) An isothermal amplification system that can amplify a target sequence larger than about one thousand nucleotides.
- 49. (currently amended) A method for determining whether a helicase is suited for exponentially and selectively amplifying a target nucleic acid in a helicase-dependent reaction, comprising;
 - (a) preparing a helicase preparation comprising the helicase, an NTP or dNTP, a buffer, wherein the buffer has a pH in the range of about pH 6.0- 9.0, a concentration of NaCl or KCl in a concentration range of 0-200mM, and Tris-acetate or Tris-HCl and optionally one or more single strand binding proteins and an accessory protein to which is added one or more single strand binding proteins unless the helicase is thermostable wherein the single strand binding protein is not required;
 - (b) adding a target nucleic acid, oligonucleotide primers, four dNTPs and a DNA polymerase to the helicase preparation.

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- (c) incubating the mixture at a temperature between about 20°C and 75°C; and
- (d) analyzing the DNA on an agarose gel to determine whether selective and exponential amplification has occurred.
- 50. (original) A method according to claim 49, further comprising optimizing the conditions of helicase dependent amplification by varying the concentration of any or each of: the helicase; the single stranded binding protein; the accessory protein; the NTP or dNTP; the salt concentration; the pH; and varying the buffer type; the temperature; the time of incubation and the length of the target nucleic acid.
- 51. (new) A method for helicase-dependent amplification of a target nucleic acid, comprising:
- (a) adding to the target nucleic acid, a helicase preparation comprising a helicase and a single strand binding protein unless the helicase is a thermostable helicase in which case the single strand binding protein is not required, a plurality of oligonucleotide primers and one or more polymerases; and
- (b) amplifying, by helicase-dependent amplification, the target nucleic acid wherein the amplification does not occur in the absence of the helicase as determined by gel electrophoresis.